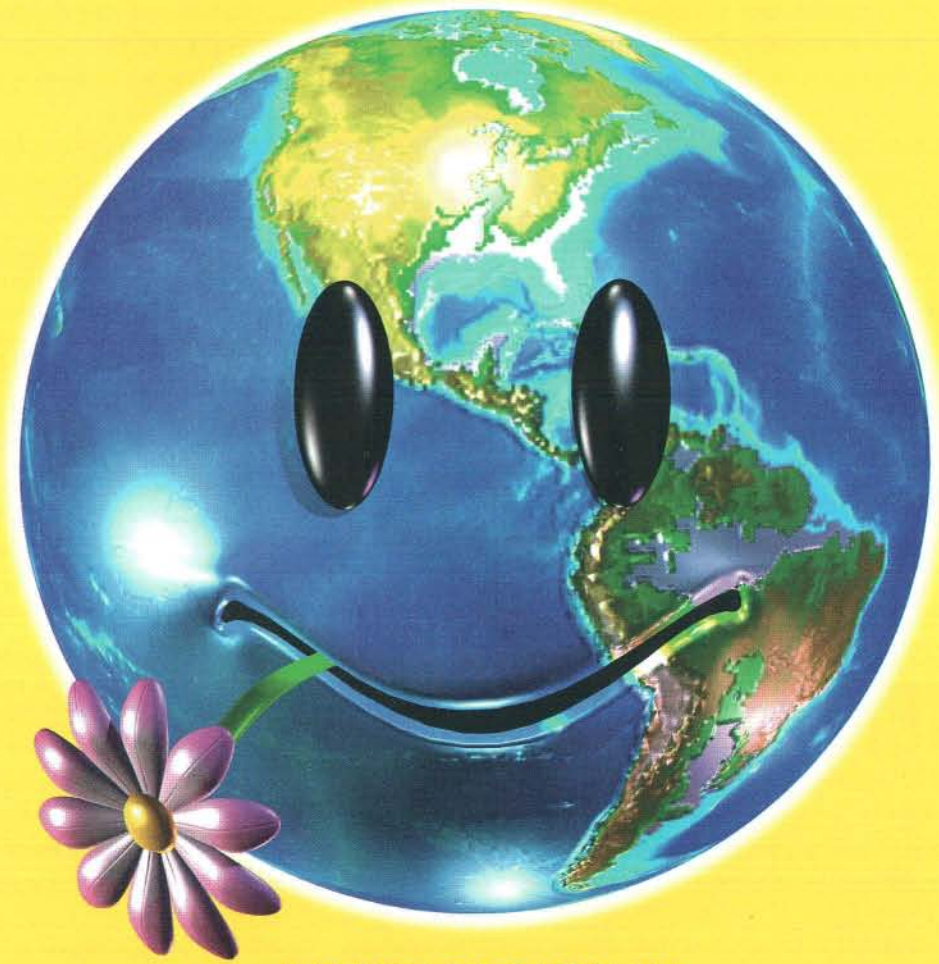
THE LONG BOOM



A HISTORY OF THE FUTURE 1980-2020

BY PETER SCHWARTZ AND PETER LEYDEN

WE'RE FACING 25 YEARS OF PROSPERITY, FREEDOM, AND A BETTER ENVIRONMENT FOR THE WHOLE WORLD.

YOU GOT A PROBLEM WITH THAT?

www.wired.com/5.07/longboom/

IMAGE: MICHA KLEIN

A BAD MEME – a contagious idea – began spreading through the United States in the 1980s: America is in decline, the world is going to hell, and our children's lives will be worse than our own. The particulars are now familiar: Good jobs are disappearing, working people are falling into poverty, the underclass is swelling, crime is out of control. The post-Cold War world is fragmenting, and conflicts are erupting all over the planet. The environment is imploding – with global warming and ozone depletion, we'll all either die of cancer or live in *Waterworld*. As for our kids, the collapsing educational system is producing either gun-toting gangsters or burger-flipping dopes who can't read.

By the late 1990s, another meme began to gain ground. Borne of the surging stock market and an economy that won't die down, this one is more positive: America is finally getting its economic act together, the world is not such a dangerous place after all, and our kids just might lead tolerable lives. Yet the good times will come only to a privileged few, no more than a fortunate fifth of our society. The vast majority in the United States and the world face a dire future of increasingly desperate poverty. And the environment? It's a lost cause.

BUT THERE'S A NEW, VERY DIFFERENT MEME, A RADICALLY OPTIMISTIC MEME: We are watching the beginnings of a global economic boom on a scale never experienced before. We have entered a period of sustained growth that could eventually double the world's economy every dozen years and bring increasing prosperity for – quite literally – billions of people on the planet. We are riding the early waves of a 25-year run of a greatly expanding economy that will do much to solve seemingly intractable problems like poverty and to ease tensions throughout the world. And we'll do it without blowing the lid off the environment.

If this holds true, historians will look back on our era as an extraordinary moment. They will chronicle the 40-year period from 1980 to 2020 as the key years of a remarkable transformation. In the developed countries of the West, new technology will lead to big productivity increases that will cause high economic growth – actually, waves of technology will continue to roll out through the early part of the 21st century. And then the relentless process of globalization, the opening up of national economies and the integration of markets, will drive the growth through much of the rest of the world. An unprecedented alignment of an ascendent Asia, a revitalized America, and a reintegrated greater Europe – including a recovered Russia – together will create an economic juggernaut that pulls along most other regions of the planet. These two metatrends – fundamental technological change and a new ethos of openness – will transform our world into the beginnings of a global civilization, a new civilization of civilizations, that will blossom through the coming century.

Think back to the era following World War II, the 40-year span from 1940 to 1980 that immediately precedes our own. First, the US economy was flooded with an array of new technologies that had been stopped up by the war effort: mainframe computers, atomic energy, rockets, commercial aircraft, automobiles, and television. Second, a new integrated market was devised for half the world – the so-called free world – in part through the creation of institutions like the World Bank and the International Monetary Fund. With the technology and the enhanced system of international trade in place by the end of the 1940s, the US economy roared through the 1950s, and the world economy joined in through the 1960s, only to flame out in the 1970s with high inflation – partly a sign of growth that came too fast. From 1950 to 1973, the world economy grew at an average 4.9 percent – a rate not matched since, well, right about now. On the backs of that roaring economy and increasing prosperity came social, cultural, and political repercussions. It's no coincidence that the 1960s were called revolutionary. With spreading affluence came great pressure from disenfranchised races and other interest groups for social reform, even overt political revolution.

Strikingly similar – if not still more powerful – forces are in motion today. The end of the military state of readiness in the 1980s, as in the 1940s, unleashed an array of new technologies, not the least of which is the Internet. The end of the Cold War also saw the triumph of a set of ideas long championed by the United States: those of the free-market economy and, to some extent, liberal democracy. This cleared the way for the creation of a truly global economy, one integrated market. Not half the world, the free world. Not one large colonial empire. Everybody on the planet in the same economy. This is historically unprecedented, with unprecedented consequences to follow. In the 1990s, the United States is experiencing a booming economy much like it did in the 1950s. But look ahead to the next decade, our parallel to the 1960s. We may be entering a relentless economic expansion, a truly global economic boom, the long boom.

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IMAGE: MICHA KLEIN

We are watching the beginnings of a global economic boom on a scale never experienced before. We have entered a period of sustained growth that could eventually double the world's economy every dozen years and bring increasing prosperity for – quite literally – billions of people on the planet. We are riding the early waves of a 25-year run of a greatly expanding economy that will do much to solve seemingly intractable problems like poverty and to ease tensions throughout the world. And we'll do it without blowing the lid off the environment.

Sitting here in the late 1990s, it's possible to see how all the pieces could fall into place. It's possible to construct a scenario that could bring us to a truly better world by 2020. It's not a prediction, but a scenario, one that's both positive and plausible. Why plausible? The basic science is now in place for five great waves of technology – personal computers, telecommunications, biotechnology, nanotechnology, and alternative energy – that could rapidly grow the economy without destroying the environment. This scenario doesn't rely on a scientific breakthrough, such as cold fusion, to feed our energy needs. Also, enough unassailable trends – call them predetermined factors – are in motion to plausibly predict their outcome. The rise of Asia, for example, simply can't be stopped. This is not to say that there aren't some huge unknowns, the critical uncertainties, such as how the United States handles its key role as world leader.

Why a positive scenario? During the global standoff of the Cold War, people clung to the original ideological visions of a pure form of communism or capitalism. A positive scenario too often amounted to little more than surviving nuclear war. Today, without the old visions, it's easy enough to see how the world might unravel into chaos. It's much more difficult to see how it could all weave together into something better. But without an expansive vision of the future, people tend to get shortsighted and mean-spirited, looking out only for themselves. A positive scenario can inspire us through what will inevitably be traumatic times ahead.

So suspend your disbelief. Open up to the possibilities. Try to think like one of those future historians, marveling at the changes that took place in the 40-year period that straddled the new millennium. Sit back and read through the future history of the world.

THE BOOM'S BIG BANG

From a historical vantage point, two developments start around 1980 that will have profound consequences for the US economy, the Western economy, then the global economy at large. One is the introduction of personal computers. The other is the breakup of the Bell System. These events trigger two of the five great waves of technological change that will eventually help fuel the long boom.

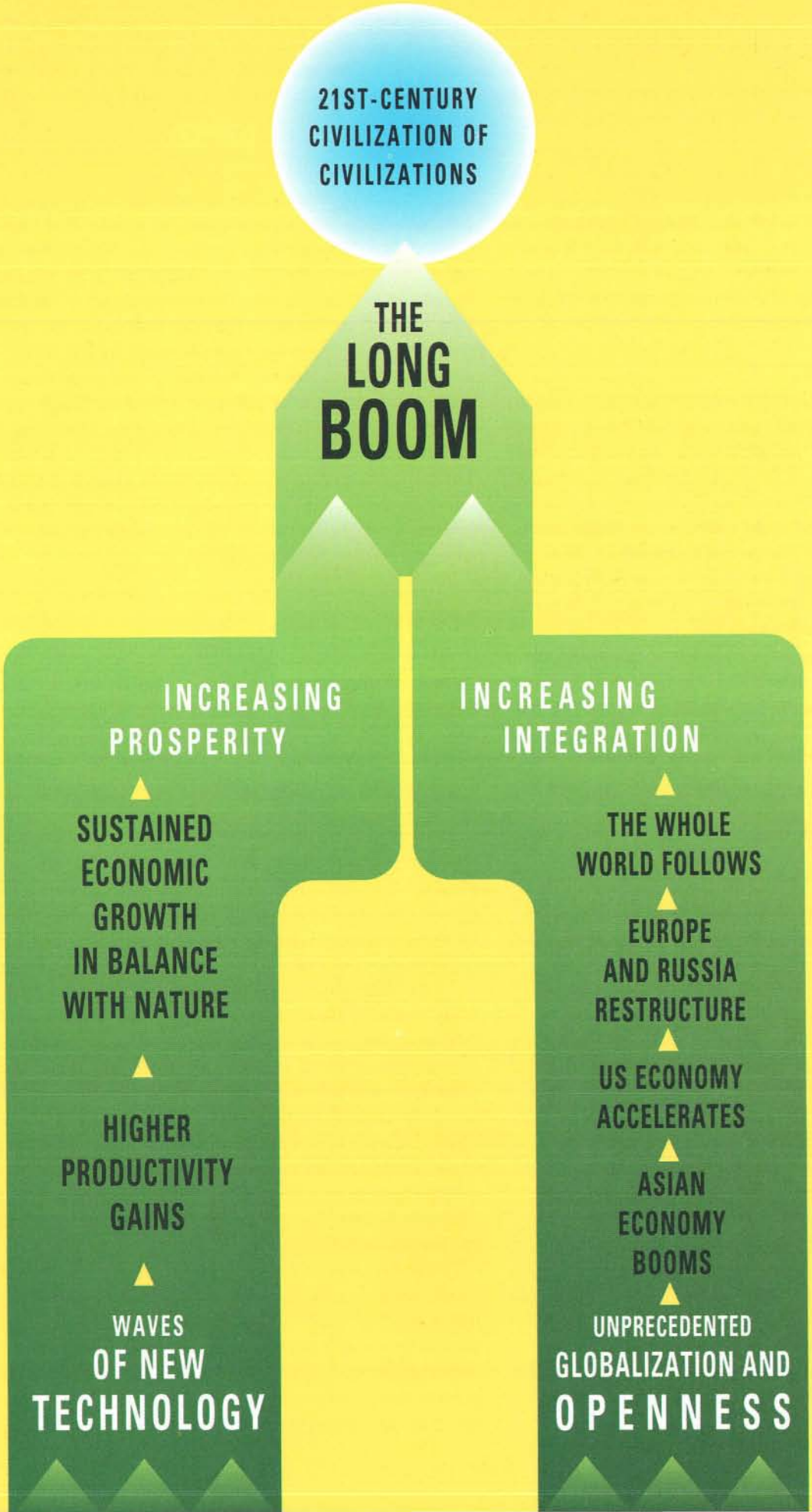
The full impact can be seen in the sweep of decades. In the first 10 years, personal computers are steadily adopted by businesses. By 1990, they begin to enter the home, and the microprocessor is being embedded in many other tools and products, such as cars. By the turn of the century, with the power of computer chips still roughly doubling every 18 months, everything comes with a small, cheap silicon brain. Tasks like handwriting recognition become a breeze. Around 2010, Intel builds a chip with a billion transistors – 100 times the complexity of the most advanced integrated circuits being designed in the late 1990s. By 2015, reliable simultaneous language translation has been cracked – with immediate consequences for the multilingual world.

The trajectory for the telecommunications wave follows much the same arc. The breakup of Ma Bell, initiated in 1982, triggers a frenzy of entrepreneurial activity as nascent companies like MCI and Sprint race to build fiber-optic networks across the country. By the early 1990s, these companies shift from moving voice to moving data as a new phenomenon seems to come out of nowhere: the Internet. Computers and communications become inextricably linked, each feeding the phenomenal growth of the other. By the late 1990s, telecom goes wireless. Mobile phone systems and all-purpose personal communications services arrive first with vast antennae networks on the ground. Soon after, the big satellite projects come online. By 1998, the Iridium global phone network is complete. By 2002, Teledesic's global Internet network is operational. These projects, among others, allow seamless connection to the information infrastructure anywhere on the planet by early in the century. By about 2005, high-bandwidth connections that can easily move video have become common in developed countries, and videophones finally catch on.

The symbiotic relationship between these technology sectors leads to a major economic discontinuity right around 1995, generally attributed to the explosive growth of the Internet. It's the long boom's Big Bang – immediately fueling economic growth in the traditional sense of direct job creation but also stimulating growth in less direct ways. On the most obvious level, hardware and infrastructure companies experience exponential growth, as building the new information network becomes one of the great global business opportunities around the turn of the century.

A new media industry also explodes onto the scene to take advantage of the network's unique capabilities, such as interactivity and individual customization. Start-ups plunge into the field, and traditional media companies lumber in this direction. By the late 1990s, the titans of the media industry are in a high-stakes struggle over control of the evolving medium. Relative newcomers like Disney and Microsoft ace out the old-guard television networks in a monumental struggle over digital TV. After a few fits and starts, the Net becomes the main medium of the 21st century.

The development of online commerce quickly follows on new media's heels. First come the entrepreneurs who figure out how to encrypt messages, conduct safe financial transactions in cyberspace, and advertise one to one. Electronic cash, a key milestone, gains acceptance around 1998. Then come businesses selling everyday consumer goods. First it's high tech products such as software, then true information products like securities. Soon everything begins to be sold in cyberspace. By 2000, online



THE LOGIC OF THE LONG BOOM

Two major forces – fundamental technological change and a new ethos of openness – are driving through our era, forces that could bring about the long boom, a 25-year global expansion with all its consequences.

Five waves of technology – computers, telecommunications, biotechnology, nanotechnology, and alternative energy – may bring about big productivity increases that lead to high rates of economic growth, in balance with nature.

Meanwhile, we're seeing unprecedented global integration. For the first time ever, all regions of the world are interlocking their economies and becoming increasingly interdependent.

Soon we may see a fortuitous alignment: Asia continues its amazing economic boom. America accelerates its tech-led economy. Europe reintegrates and recovers from its chronic economic slump. Russia breaks through in its transition to capitalism. And the rest of the world eventually follows the lead of the major powers.

These two metadevelopments lead to increasing integration and prosperity worldwide, which lays the groundwork for a more open global society and a civilization of civilizations in the 21st century. At least, that's the gist of the long boom argument.

sales hit US$10 billion, still small by overall retail standards. Around 2005, 20 percent of Americans teleshop for groceries.

Alongside the migration of the traditional retail world into cyberspace, completely new types of work are created. Many had speculated that computer networks would lead to disintermediation – the growing irrelevance of the middleman in commerce. Certainly the old-style go-betweens are sideswiped, but new types of intermediaries arise to connect buyers to sellers. And with the friction taken out of the distribution system, the savings can be channeled into new ventures, which create new work.

THE BIRTH OF THE NETWORKED ECONOMY

New technologies have an impact much bigger than what literally takes place online. On a more fundamental level, the networked economy is born. Starting with the recession of 1990-91, American businesses begin going through a wrenching process of reengineering, variously described at the time as downsizing, outsourcing, and creating the virtual corporation. In fact, they are actually taking advantage of new information technologies to create the smaller, more versatile economic units of the coming era.

Businesses, as well as most organizations outside the business world, begin to shift from hierarchical processes to networked ones. People working in all kinds of fields – the professions, education, government, the arts – begin pushing the applications of networked computers. Nearly every facet of human activity is transformed in some way by the emergent fabric of interconnection. This reorganization leads to dramatic improvements in efficiency and productivity.

Productivity, as it happens, becomes one of the great quandaries stumping economists throughout the 1990s. Despite billions invested in new technologies, traditional government economic statistics reflect little impact on productivity or growth. This is not an academic point – it drives to the heart of the new economy. Businesses invest in new technology to boost the productivity of their workers. That increased productivity is what adds value to the economy – it is the key to sustained economic growth.

Research by a few economists, like Stanford University's Paul Romer, suggests that fundamentally new technologies generally don't become productive until a generation after their introduction, the time it takes for people to really learn how to use them in new ways. Sure enough, about a generation after the introduction of personal computers in the workplace, work processes begin mutating enough to take full advantage of the tool. Soon after, economists figure out how to accurately measure the true gains in productivity – and take into account the nebulous concept of improvement in quality rather than just quantity.

By 2000, the US government adopts a new information-age standard of measuring economic growth. Unsurprisingly, actual growth rates are higher than what had registered on the industrial-age meter. The US economy is growing at sustained rates of around 4 percent – rates not seen since the 1960s.

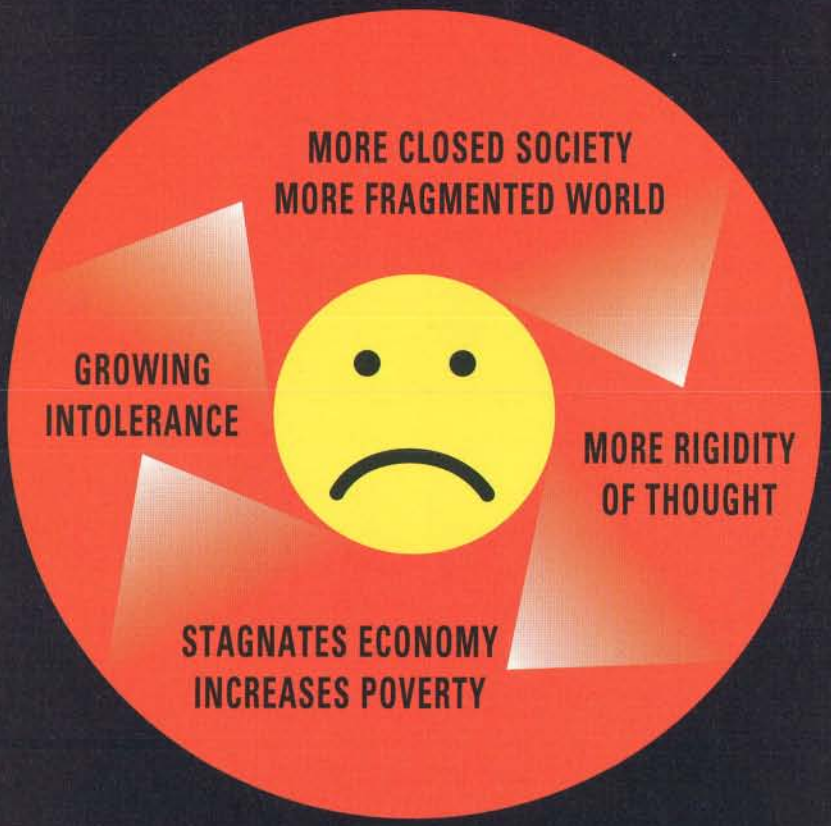
The turn of the century marks another major shift in government policy, as the hidebound analysis of inflation is finally abandoned in light of the behavior of the new economy. While the Vietnam War, oil shocks, and relatively closed national labor markets had caused genuine inflationary pressures that wreaked havoc on the economy through the 1970s, the tight monetary policies of the 1980s soon harness the inflation rate and lead to a solid decade with essentially no wage or price rises. By the 1990s, globalization and international competition add to the downward pressure. By 2000, policymakers finally come around to the idea that you can grow the economy at much higher rates and still avoid the spiral of inflation. The millennium also marks a symbolic changing of the guard at the Federal Reserve Bank: Alan Greenspan retires, the Fed lifts its foot off the brake, and the US economy really begins to take off.

MORE TECH WAVES

Right about the turn of the century, the third of the five waves of technology kicks in. After a couple false starts in the 1980s and 1990s, biotechnology begins to transform the medical field. One benchmark comes in 2001 with the completion of the Human Genome Project, the effort to map out all human genes. That understanding of our genetic makeup triggers a series of breakthroughs in stopping genetic disease. Around 2012, a gene therapy for cancer is perfected. Five years later, almost one-third of the 4,000 known genetic diseases can be avoided through genetic manipulation.

Throughout the early part of the century, the combination of a deeper understanding of genetics, human biology, and organic chemistry leads to a vast array of powerful medications and therapies. The health care system, having faced a crossroads in 1994 with President Clinton's proposed national plan, continues restructuring along the more decentralized, privatized model of HMOs. The industry is already booming when biotech advances begin clicking in the first decade of the century. It receives a further stimulus when the baby boomers begin retiring en masse in 2011. The industry becomes a big jobs provider for years to come.

The biotech revolution profoundly affects another economic sector – agriculture. The same deeper understanding of genetics leads to much more precise breeding of plants. By about 2007, most US produce is being genetically engineered by these new direct techniques. The same process takes place with livestock. In 1997, the cloning of sheep in the United Kingdom startles the world and kicks



THE VICIOUS CIRCLE

THE VIRTUOUS CIRCLE

CHEAT SHEET FOR THE 21ST CENTURY: CLOSED, BAD. OPEN, GOOD.

Here's the formula for success in the coming era: Open, good. Closed, bad. Apply it to technology standards, to business strategies, to philosophies of life. That's the winning concept for individuals, for nations, for the global community in the years ahead.

If the world takes the closed route, it starts a vicious circle that swirls downward. Nations turn in on themselves. The world fragments into isolated blocs. This strengthens traditionalists and leads to rigidity of thought. This stagnates the economy and brings increasing poverty. This leads to conflicts and increasing intolerance, which brings about an even more closed society and a more fragmented world.

If, on the other hand, the world adopts the open model, then a much different, virtuous circle opens up: open societies turn outward and strive to integrate into the world. This openness to change and exposure to new ideas leads to innovation and progress. This brings rising affluence for more people and a decrease in poverty. This leads to growing tolerance and appreciation of diversity, which brings us to a more open society and a more highly integrated world.

off a flurry of activity in this field. By the turn of the century, prize livestock is being genetically tweaked as often as traditionally bred. By about 2005, animals are used for developing organs that can be donated to humans. Superproductive animals and ultrahardy, high-yielding plants bring another veritable green revolution to countries sustaining large populations.

By the end of the transitional era, around 2020, real advances begin to be made in the field of biological computation, where billions of relatively slow computations, done at the level of DNA, can be run simultaneously and brought together in the aggregate to create the ultimate in parallel processing. So-called DNA computing looks as though it will bring about big advances in the speed of processing sometime after 2025 – certainly by the middle of the century.

Then comes the fourth technology wave – nanotechnology. Once the realm of science fiction, this microscopic method of construction becomes a reality in 2015. Scientists and engineers figure out reliable methods to construct objects one atom at a time. Among the first commercially viable products are tiny sensors that can enter a person's bloodstream and bring back information about its composition. By 2018, these micromachines are able to do basic cell repair. However, nanotechnology promises to have a much more profound impact on traditional manufacturing as the century rolls on. Theoretically, most products could be produced much more efficiently through nanotech techniques. By 2025, the theory is still far from proven, but small desktop factories for producing simple products arrive.

By about 2015, nanotech techniques begin to be applied to the development of computing at the atomic level. Quantum computing, rather than DNA computing, proves to be the heir to microprocessors in the short run. In working up to the billion-transistor microprocessor in 2010, engineers seem to hit insurmountable technical barriers: the scale of integrated circuits has shrunk so small that optical-lithography techniques fail to function. Fortunately, just as the pace of microprocessing power begins to wane, quantum computing clicks in. Frequent increases in computing power once again promise to continue unabated for the foreseeable future.

THE EARTH SAVER

All four waves of technology coursing through this era – computers, telecom, biotech, and nanotech – contribute to a surge of economic activity. In the industrial era, a booming economy would have put a severe strain on the environment: basically everything we made, we cooked, and such high-temperature cooking creates a lot of waste byproducts. The logic of the era also tended toward larger and larger factories, which created pollution at even greater scales.

Biotech, on the other hand, uses more moderate temperature realms and emulates the processes of nature, creating much less pollution. Infotech, which moves information electronically rather than physically, also makes much less impact on the natural world. Moving information across the United States through the relatively simple infotechnology of the fax, for example, proves to be seven times more energy efficient than sending it through Federal Express. Furthermore, these technologies are on an escalating track of constant refinement, with each new generation becoming more and more energy efficient, with lower and lower environmental impact. Even so, these increasing efficiencies are not enough to counteract the juggernaut of a booming global economy.

Fortunately, the fifth wave of new technology – alternative energy – arrives right around the turn of the century with the introduction of the hybrid electric car. Stage one begins in the late 1990s when automobile companies such as Toyota roll out vehicles using small diesel- or gasoline-fueled internal-combustion engines to power an onboard generator that then drives small electric motors at each wheel. The car runs on electric power at low RPMs but uses the internal-combustion engine at highway speeds, avoiding the problem of completely battery-powered electric vehicles that run out of juice after 60 miles. The early hybrids are also much more efficient than regular gas-powered cars, often getting 80 miles to a gallon.

Stage two quickly follows, this time spurred by aerospace companies such as Allied Signal, which leverage their knowledge of jet engines to build hybrids powered by gas turbines. By 2005, technology previously confined to aircraft's onboard electric systems successfully migrates to automobiles. These cars use natural gas to power the onboard generators, which then drive the electric motors at the wheels. They also make use of superstrong, ultralight new materials that take the place of steel and allow big savings on mileage.

Then comes the third and final stage: hybrids using hydrogen fuel cells. The simplest and most abundant atom in the universe, hydrogen becomes the source of power for electric generators – with the only waste product being water. No exhaust. No carbon monoxide. Just water. The basic hydrogen-power technology had been developed as far back as the Apollo space program, though then it was still extremely expensive and had a nasty tendency to

THE FUTURE HISTORY OF THE WORLD

A TIME LINE FOR THE LONG BOOM

Say we are in the midst of a 40-year millennial transition, a period that began right around 1980. Say we are on the front lip of a worldwide economic boom.

Looking back, we can identify early signs of the forces that have gathered strength over the last 15 years and are now driving through our lives. By following that forward motion, we can rough out possible developments in the next couple decades.

These are not outright predictions, but informed projections. They help give shape to a positive scenario of the future, the long boom.

blow up. By the late 1990s, research labs such as British Columbia-based Ballard Power Systems are steadily developing the technology with little public fanfare. Within 10 years, there are transitional hydrogen car models that extract fuel from ordinary gasoline, using the existing network of pumps. By 2010, hydrogen is being processed in refinery-like plants and loaded onto cars that can go thousands of miles – and many months – before refueling. The technology is vastly cheaper and safer than in the 1960s and well on its way to widespread use.

These technological developments drive nothing less than a wholesale transformation of the automobile industry through the first quarter of the new century. Initially prodded by government decrees such as California's zero-emission mandate – which called for 10 percent of new cars sold to have zero emissions by 2003 – the industrial behemoths begin to pick up speed when an actual market for hybrid cars opens up. People buy them not because they are the environmentally correct option but because they're sporty, fast, and fun. And the auto companies build them because executives see green – as in money, not trees.

This 10- to 15-year industrial retooling sends reverberations throughout the global economy. The petrochemical giants begin switching from maintaining vast networks that bring oil from remote Middle Eastern deserts to building similarly vast networks that supply the new elements of electrical power. Fossil fuels will continue to be a primary source of power into the middle of the 21st century – but they will be clean fossil fuels. By 2020, almost all new cars are hybrid vehicles, mostly using hydrogen power. That development alone defuses much of the pressure on the global environment. The world may be able to support quite a few additional automobile drivers – including nearly 2 billion Chinese.

ASIA ASCENDANT

While the end of the Cold War initiates the waves of technology rippling through our 40-year era, that's only half the story. The other half has to do with an equally powerful force: globalization. While it is spurred by new technologies, the emergence of an interconnected planet is propelled more by the power of an idea – the idea of an open society.

From a historical vantage point, globalization also begins right around 1980. One of the souls who best articulates this idea of the open society is Mikhail Gorbachev. It's Gorbachev who helps bring about some of its most dramatic manifestations: the fall of the Wall, the collapse of the Soviet empire, the end of the Cold War. He helps inititate a vast wave of political change that includes the democratization of eastern Europe and Russia itself. To kick it off, Gorbachev introduces two key concepts to his pals in the Politburo in 1985, two ideas that will resonate not just in the Soviet Union but through all the world. One is *glasnost*. The other is *perestroika*. Openness and restructuring – the formula for the age, the key ingredients of the long boom.

An equally important character is China's Deng Xiaoping. His actions don't bring about the same dramatic political change, but right around the same time as Gorbachev, Deng initiates a similarly profound shift of policies, applying the concepts of openness and restructuring to the economy. This process of opening up – creating free trade and free markets – ultimately makes just as large a global impact. No place is this more apparent than in Asia.

Japan grasps the gist of this economic formula long before the buzz begins, pulling a group of Asian early adopter countries in its wake. By the 1980s, Japan has nearly perfected the industrial-age manufacturing economy. But by 1990, the rules of the global economy have changed to favor more nimble, innovative processes, rather than meticulous, methodical economies of scale. Many of the attributes that favored Japan in the previous era, such as a commitment to lifelong employment and protected domestic markets, work against the country this time around. Japan enters the long slump of the 1990s. By the end of the decade, Japan has watched the United States crack the formula for success in the networked economy and begins to adopt the model in earnest. In 2000, it radically liberalizes many of its previously protected domestic markets – a big stimulus for the world economy at large.

Japan's rise, however, is but a prelude to the ascendance of China. In 1978, Deng takes the first steps toward liberalizing the communist economy. China slowly gathers force through the 1980s, until the annual growth in the gross national product consistently tops 10 percent. By the 1990s, the economy is growing at a torrid pace, with the entire coast of China convulsed with business activity and boomtowns sprouting all over the place. Nineteen ninety-seven – a year marked by both the death of Deng and the long-awaited return of Hong Kong – symbolizes the end of China's ideological transition and the birth of a real economic world power.

The first decade of the new century poses many

problems for China domestically – and for the rest of the world. The overheated economy puts severe strain on the fabric of Chinese society, particularly between the increasingly affluent urban areas on the coast and the 800 million impoverished peasants in the interior. The nation's relatively low tech smokestack economy also threatens to single-handedly push the global environment over the edge. The Chinese initially do little to reduce their level of dependence on coal, which in the late 1990s still supplies three-quarters of the country's energy needs. Only sustained efforts by the rest of the world to ensure that China has access to the very best transportation and industrial technology avert an environmental catastrophe. Occasionally using draconian measures, China manages to avoid severe internal disturbance. By 2010, the sense of crisis has dissipated. China is generally acknowledged to be on a path toward more democratic politics – though not in the image of the West.

With the reemergence of China's economic might, the 3,500-year-old civilization begins to assert itself and play a larger part in shaping the world. Chinese clan-based culture happens to work very well within the fluid demands of the networked global economy. Singapore and Hong Kong prove the point through the 1980s and 1990s, when the two city-states with almost no land mass or natural resources become economic powers through pure human capital, primarily brainpower.

For years, Chinese expatriates have established intricate financial networks throughout Western countries, but especially in Asia. Many Southeast Asian economies – if not governments – are completely dominated by the overseas Chinese. By about 2005, the mainland Chinese decide to capitalize on this by formalizing the Chinese diaspora. Though the entity has no legal status vis-à-vis other governments, it has substantial economic clout. That date also marks the absorption of Taiwan into China proper.

By 2020, the Chinese economy has grown to be the largest in the world. Though the US economy is more technologically sophisticated, and its population more affluent, China and the United States are basically on a par. China has also drawn much of Asia in its economic wake – Hong Kong and Shanghai are the key financial nodes for this intricate Asian world.

Asia is jammed with countries that are economic powerhouses in their own right. India builds on its top-notch technical training and mastery of the lingua franca of the high tech world, English, to challenge many Western countries in software development. Malaysia's audacious attempt to jump-start an indigenous high tech sector through massive investments in a multimedia supercorridor pays off. The former communist countries Vietnam and Cambodia turn out to be among the most adept at capitalism. The entire region – from the reunited Koreas to Indonesia to the subcontinent – is booming. In just 20 years, 2 billion people have made the transition into what can be considered a middle-class lifestyle. In the space of one full 80-year life span, Asia has gone from almost uninterrupted poverty to widespread wealth.

THE EUROPEAN SHUFFLE

Meanwhile, on the other side of the planet, the new principles of openness and restructuring are applied first in politics, then economics. In the aftermath of the spectacular implosion of the Soviet Union, most energy is spent promoting democracy and dismantling the vestiges of the Cold War. With time, an equal amount of energy is applied to restructuring and retooling economies – in some obvious and not so obvious ways.

First, Europe at large has to reintegrate itself, both economically and politically. Much of the 1990s is spent trying to integrate eastern and western Europe. All eyes first focus on the new Germany, which powers through the process on the basis of sheer financial might. Next the more advanced of the eastern European countries – Poland, Hungary, the Czech Republic – get integrated, first into NATO, with formal acceptance in 2000, and then into the European Union in 2002. The more problematic countries of eastern Europe aren't accepted into the union for another couple years. Alongside this East-West integration comes a more subtle integration between the western European countries. With fits and starts, Europe moves toward the establishment of one truly integrated entity. The European currency – the euro – is adopted in 1999, with a few laggards, like Britain, holding out a few more years.

Though the UK may have dragged its feet on the European currency measure, in an overall sense it's far ahead of the pack. The economic imperative of the era is not just to integrate externally but to restructure internally. Right around 1980, Margaret Thatcher and Ronald Reagan begin putting together the formula that eventually leads toward the new economy. At the time it looks brutal: busting unions, selling off state-owned industries, and dismantling the welfare state. In hindsight, the pain pays off. By the mid-1990s, the US unemployment rate is near 5 percent, and the British rate has dropped to almost 6 percent. In contrast, unemployment on the European continent hovers at 11 percent, with some individual countries even higher.

Indeed, through the 1990s, the rest of Europe remains trapped in the legacy of its welfare states, which maintain their political attractiveness long after they outlive their economic worth. By 2000, chronic unemployment and mounting government deficits finally force leaders on the continent to act. Despite widespread popular protests, especially in France, Europe goes through a painful economic restructuring much like the United States did a decade before. As part of this perestroika, it retools its

economy using the new information technologies. This restructuring, both of corporations and governments, has much the same effect it had on the US economy. The European economy begins to surge and create many new jobs. By about 2005, Europe – particularly in the northern countries like Germany – even has the beginnings of a serious labor shortage as aging populations begin to retire.

Then the Russian economy kicks in. For 15 years, Russia had been stumbling along in its transition to a capitalist economy, periodically frightening the West with overtures that it might return to its old militaristic ways. But after almost two decades of wide-open Mafia-style capitalism, Russia emerges in about 2005 with the basic underpinnings of a solid economy. Enough people are invested in the new system, and enough of the population has absorbed the new work ethic, that the economy can function quite well – with few reasons to fear a retrenchment. This normalization finally spurs massive foreign investment that helps the Russians exploit their immense natural resources, and the skills of a highly educated populace. These people also provide a huge market for Europe and the rest of the world.

THE GLOBAL STAMPEDE

By the close of the 20th century, the more developed Western nations are forging ahead on a path of technology-led growth, and booming Asia is showing the unambiguous benefits of developing market economies and free trade. The path for the rest of the world seems clear. Openness and restructuring. Restructuring and openness. Individually, nations begin adopting the formula of deregulating, privatizing, opening up to foreign investment, and cutting government deficits. Collectively, they sign onto international agreements that accelerate the process of global integration – and fuel the long boom.

Two milestones come in 1997: the Information Technology Agreement, in which almost all countries trading in IT agree to abolish tariffs by 2000, and the Global Telecommunications Accord, in which almost 70 leading nations agree to rapidly deregulate their domestic telecom markets. These two developments quickly spread the two key technologies of the era: computers and telecommunications.

Everyone benefits, particularly the underdeveloped economies, which take advantage of the leapfrog effect, adopting the newest, cheapest, best technology rather than settling for obsolete junk. IT creates a remarkable dynamic that brings increasing power, performance, and quality to each new generation of the technology – plus big drops in price. Also, wireless telecommunications allow countries to avoid the huge effort and expense of building wired infrastructures through crowded 168 ►

TEN SCENARIO SPOILERS

The long boom is a scenario, one possible future. It's built upon the convergence of many big forces and even more little pieces falling into place – all of them with a positive twist. The future, of course, could turn out to be very different – particularly if a few of those big pieces go haywire. Here are 10 things that could cut short the long boom:

1.
Tensions between China and the US escalate into a new Cold War – bordering on a hot one.

2.
New technologies turn out to be a bust. They simply don't bring the expected productivity increases or the big economic boosts.

3.
Russia devolves into a kleptocracy run by a mafia or retreats into quasicommunist nationalism that threatens Europe.

4.
Europe's integration process grinds to a halt. Eastern and western Europe can't finesse a reunification, and even the European Union process breaks down.

5.
Major ecological crisis causes a global climate change that, among other things, disrupts the food supply – causing big price increases everywhere and sporadic famines.

6.
Major rise in crime and terrorism forces the world to pull back in fear. People who constantly feel they could be blown up or ripped off are not in the mood to reach out and open up.

7.
The cumulative escalation in pollution causes a dramatic increase in cancer, which overwhelms the ill-prepared health system.

8.
Energy prices go through the roof. Convulsions in the Middle East disrupt the oil supply, and alternative energy sources fail to materialize.

9.
An uncontrollable plague – a modern-day influenza epidemic or its equivalent – takes off like wildfire, killing upward of 200 million people.

10.
A social and cultural backlash stops progress dead in its tracks. Human beings need to choose to move forward. They just may not ...

◄ 129 cities and diffuse countrysides.

This all bodes well for the world economy. Through most of the 1970s, all the 1980s, and the early 1990s, the real growth rate in the world's gross domestic product averages 3 percent. By 1996, the rate tops a robust 4 percent. By 2005, it hits an astounding 6 percent. Continued growth at this rate will double the size of the world economy in just 12 years, doubling it twice in just 25 years. This level of growth surpasses the rates of the last global economic boom, the years following World War II, which averaged 4.9 percent from 1950 to 1973. And this growth comes off a much broader economic base, making it more remarkable still. Unlike the last time, almost every region of the planet, even in the undeveloped world, participates in the bonanza.

Latin America takes off. These countries, after experiencing the nightmare of debt in the 1980s, do much to vigorously restructure their economies in the 1990s. Chile and Argentina are particularly innovative, and Brazil builds on an extensive indigenous high tech sector. But the real boost from 2000 onward comes from capitalizing on Latin America's strategic location on the booming Pacific Rim and on its proximity to the United States. The region becomes increasingly drawn into the booming US economy. In 1994, the North American Free Trade Agreement formally links the United States to Mexico and Canada. By about 2002, an All American Free Trade Agreement is signed – integrating the entire hemisphere into one unified market.

The Middle East, meanwhile, enters crisis. Two main factors drive the region's problems. One, the fundamentalist Muslim mind-set is particularly unsuited to the fluid demands of the digital age. The new economy rewards experimentation, constant innovation, and challenging the status quo – these attributes, however, are shunned in many countries throughout the Middle East. Many actually get more traditional in response to the furious pace of change. The other factor driving the crisis is outside their control. The advent of hydrogen power clearly undermines the centrality of oil in the world economy. By 2008, with the auto industry in a mad dash to convert, the bottom falls out of the oil market. The Middle Eastern crisis comes to a head. Some of the old monarchies and religious régimes begin to topple.

An even more disturbing crisis hits Africa. While some parts of the continent, such as greater South Africa, are doing fine, central Africa devolves into a swirl of brutal ethnic conflict, desperate poverty, widespread famine and disease. In 2015 the introduction of biological weapons in an ethnic conflict, combined with the outbreak of a terrifying new natural disease, brings the death count to unimagined levels: an estimated 5 million people die in the space of six months – this on top of a cumulative death toll of roughly 100 million who perished prematurely over the previous two decades.

By 2005, the world economic growth rate hits an astounding 6 percent – a rate that will double the size of the world economy in just 12 years.

The contrast between such destitution and the spreading prosperity elsewhere finally prods the planet into collective action. Every nation, the world comes to understand, ultimately can only benefit from a thriving Africa, which will occupy economic niches that other nations are outgrowing. It makes as much practical as humanitarian sense. The regeneration of Africa becomes a prime global agenda item for the next quarter of the century.

FUTURE AFTERSHOCKS

Riding the wave of the booming economy brings other major social and political repercussions. Fundamental shifts in technology and the means of production inevitably change the way the economy operates. And when the economy changes, it doesn't take long for the rest of society to adapt to the new realities. The classic example is the transformation of agricultural society into industrial society. A new tool – the motor – led to a new economic model – capitalism – that brought great social upheaval – urbanization and the creation of an affluent class – and ultimately profound political change – liberal democracy. While that's a crude summation of a complex historical transition, the same dynamic largely holds true in our shift to a networked economy based on digital technologies.

There's also a commonsense explanation. When an economy booms, money courses through society, people get rich quick, and almost everybody sees an opportunity to improve their station in life. Optimism abounds. Think back to that period following World War II. A booming economy buoyed a bold, optimistic view of the world: we can put a man on the Moon, we can build a Great Society, a racially integrated world. In our era, we can expect the same.

By about 2000, the United States economy is doing so well that the tax coffers begin to swell. This not only solves the deficit problem but gives the government ample resources to embark on new initiatives. No longer forced to nitpick over which government programs to cut, political leaders emerge with new initiatives to help solve seemingly intractable social problems, like drug addiction. No one talks about reverting to big government, but there's plenty of room for innovative approaches to applying the pooled resources of the entire society to benefit the public at large. And the government, in good conscience, can finally afford tax cuts.

A spirit of generosity returns. The vast majority of Americans who see their prospects rising with the expanding economy are genuinely sympathetic to the plight of those left behind. This kinder, gentler humanitarian urge is bolstered by a cold, hard fact. The bigger the network, the better. The more people in the network, the better for everyone. Wiring half a town is only marginally useful. If the entire town has phones, then the system really sings. Every person, every business, every organization directly benefits from a sys-

tem in which you can pick up a phone and reach every individual rather than just a scattered few. That same principle true holds for the new networked computer technologies. It pays to get everyone tied into the new information grid. By 2000, this mentality sinks in. Almost everyone understands we're deep into a transition to a networked economy, a networked society. It makes sense to get everyone on board.

The welfare reform initiative of 1996 begins the process of drawing the poor into the economy at large. At the time, political leaders aren't talking about the network effect so much as eliminating a wasteful government program. Nevertheless, the shakeup of the welfare system coincides with the revving of the economy. Vast numbers of welfare recipients do get jobs, and the great majority eventually move up to more skilled professions. By 2002, the end of the initial five-year transitional period, welfare rolls are cut by more than half. Former welfare recipients are not the only ones benefiting from the new economy. The working poor hovering just above the poverty line also leverage their way up to more stable lives.

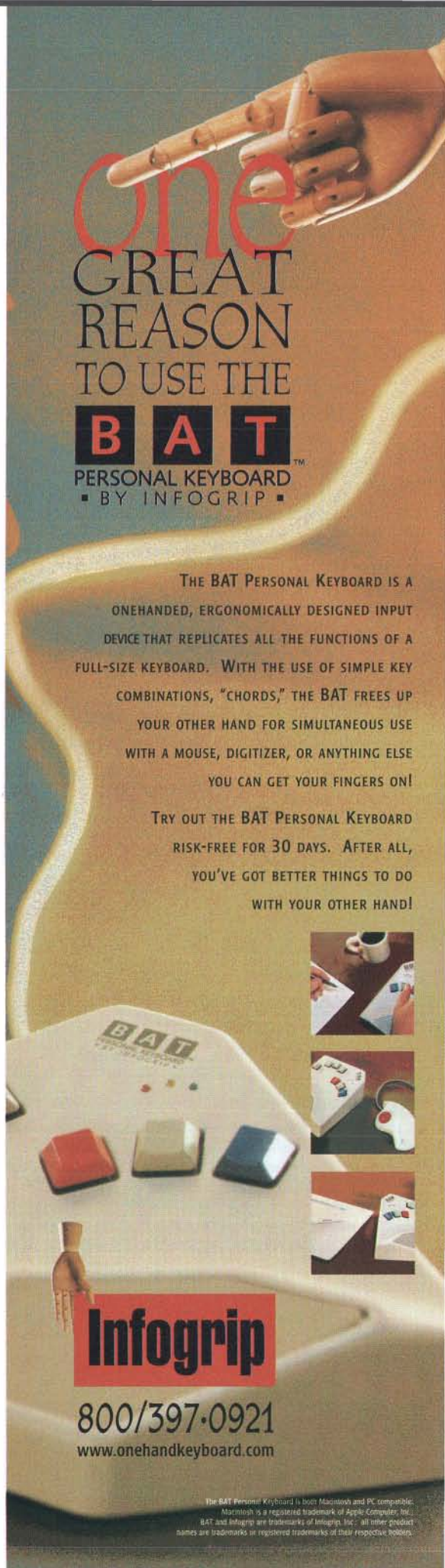
Even those from the hardened criminal underworld migrate toward the expanding supply of legitimate work. Over time, through the first decade of the century, this begins to have subtle secondary effects. The underclass, once thought to be a permanent fixture of American society, begins to break up. Social mobility goes up, crime rates go down. Though hard to draw direct linkages, many attribute the drop in crime to the rise in available work. Others point to a shift in drug policy. Starting with the passage of the California Medical Marijuana Initiative n 1996, various states begin experimenting with decriminalizing drug use. Alongside that, the failed war on drugs gets dismantled. Both initiatives are part of a general shift away from stiff law enforcement and toward more complex ways to deal with the roots of crime. One effect is to destroy the conditions that led to the rise of the inner-city drug economy. By the second decade of the century, the glorified gangsta is as much a part of history as the original gangsters in the days of Prohibition.

Immigrants also benefit from the booming economy. Attempts to stem immigration in the lean times of the early 1990s are largely foiled. By the late 1990s, immigrants are seen as valuable contributors who keep the economy humming – more able hands and brains. By the first decade of the century, government policy actively encourages immigration of knowledge workers – particularly in the software industry, which suffers from severe labor shortages. This influx of immigrants, coupled with Americans' changing attitudes toward them, brings a pleasant surprise: the revival of the family. The centrality of the family in Asian and Latino cultures, which form the bulk of these immigrants, is unquestioned. As these subcultures increasingly flow into the American mainstream, a subtle shift takes place in the general belief in the importance of family. It's not family in the nuclear-family sense but a more sprawling, amorphous, networked sense of family to fit the new times.

THE BRAIN WAVE

Education is the next industrial-era institution to go through a complete overhaul – starting in earnest in 2000. The driving force here is not so much concern with enlightening young minds as economics. In an information age, the age of the knowledge worker, nothing matters as much as that worker's brain. By the end of the 1990s, it becomes clear that the existing public K-12 school system is simply not up to the task of preparing those brains. For decades the old system has ossified and been gutted by caps on property taxes. Various reform efforts gather steam only to peter out. First George Bush then Bill Clinton try to grab the mantle of "education president" – both fail. That changes in the 2000 election, when reinventing education becomes a central campaign issue. A strong school system is understood to be as as vital to the national interest as the military once was. The resulting popular mandate shifts some of the billions once earmarked for defense toward revitalizing education.

The renaissance of education in the early part of the century comes not from a task force of luminaries setting 170 ►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The Long Boom

◄ 169 national standards in Washington, DC – the solutions flow from the hundreds of thousands of people throwing themselves at the problems across the country. The 1980s and 1990s see the emergence of small, innovative private schools that proliferate in urban areas where the public schools are most abysmal. Many focus on specific learning philosophies and experiment with new teaching techniques – including the use of new computer technologies. Beginning around 2001, the widespread use of vouchers triggers a rapid expansion in these types of schools and spurs an entrepreneurial market for education reminiscent of the can-do ethos of Silicon Valley. Many of the brightest young minds coming out of college are drawn to the wide-open possibilities in the field – starting new schools, creating new curricula, devising new teaching methods. They're inspired by the idea that they're building the 21st-century paradigm for learning.

The excitement spreads far beyond private schools, which by 2010 are teaching about a quarter of all students. Public schools reluctantly face up to the new competitive environment and begin reinventing themselves. In fact, private and public schools maintain a symbiotic relationship, with private schools doing much of the initial innovating, and public schools concentrating on making sure the new educational models reach all children in society.

Higher education, though slightly less in need of an overhaul, catches the spirit of radical reform – again driven largely by economics. The cost of four-year colleges and universities becomes absurd – in part because antiquated teaching methods based on lectures are so labor intensive. The vigorous adoption of networking technologies benefits undergraduate and graduate students even more than K-12 kids. In 2001, Project Gutenberg completes its task of putting 10,000 books online. Many of the world's leading universities begin carving off areas of expertise and assuming responsibility for the digitalization of all the literature in that field. Around 2010, all new books come out in electronic form. By 2015, relatively complete virtual libraries are up and running.

Despite earlier rhetoric, the key factor in making education work comes not from new technology, but from enshrining the value of learning. A dramatic reduction in the number of unskilled jobs makes clear that good education is a matter of survival. Indeed, nearly every organization in society puts learning at the core of its strategy for adapting to a fast-changing world. So begins the virtuous circle of the learning society. The booming economy provides the resources to overhaul education. The products of that revamped educational system enter the economy and improve its productivity. Eventually, education both sows and reaps the benefits of the long boom.

By 2020, the great cross-fertilization of ideas, the never-ending planetary conversation, has begun.

In the first decade of the century, Washington finally begins to really reinvent government. It's much the same process as the reengineering of corporations in the 1990s. The hierarchical bureaucracies of the 20th century are flattened and networked through the widespread adoption of new technologies. Some, like the IRS, experience spectacular failures, but eventually make the transition. In a more important sense, the entire approach to government is fundamentally reconsidered. The welfare and education systems are the first down that path. Driven by the imminent arrival of the first of many retiring baby boomers in 2011, Medicare and Social Security are next. Other governmental sectors soon follow.

The second decade of the century marks a more ambitious but amorphous project: making a multicultural society really work. Though the United States has the mechanics – such as the legal framework – of an integrated society in place, Americans need to learn how to accept social integration on a deeper level. The underpinnings of a booming economy make efforts to ease the tensions among various ethnic and interest groups much easier than before: people are more tolerant of others when their own livelihoods are not threatened. But people also come around to seeing diversity as a way to spark a creative edge. They realize that part of the key for success in the future is to remain open to differences, to stay exposed to alternative ways of thinking. And they recognize the rationality of building a society that draws on the strengths and creativity of all people.

Women spearhead many of the changes that help make the multicultural society work. As half the population, they are an exceptional "minority" that helps pave the way for the racial and ethnic minorities with fewer numbers. In the last global boom of the 1960s, the women's movement gained traction and helped promote the rise in the status of women. Through the 1970s and 1980s, women push against traditional barriers and work their way into business and government. By the 1990s, women have permeated the entire fabric of the economy and society. The needs, desires, and values of women increasingly begin to drive the political and business worlds – largely for the better. By the early part of the century, it becomes clear that the very skills most needed to make the networked society really hum are those that women have long practiced. Long before it became fashionable, women were developing the subtle abilities of maintaining networks, of remaining inclusive, of negotiating. These skills prove to be crucial to solving the very different challenges of this new world.

The effort to build a truly inclusive society does not just impact Americans. At the turn of the century, the United States is the closest thing the world has to a workable multicultural society. Almost all the cultures of the world have some representation, several in significant proportions. As the century moves on, it becomes clear to most people on the planet that all cultures must coexist in relative harmony on a global scale. On a meta level, it seems

that the world is heading toward a future that's prefaced by what's happening in the United States.

A CIVILIZATION OF CIVILIZATIONS

In 2020, humans arrive on Mars. It's an extraordinary event by any measure, coming a half century after people first set foot on the Moon. The four astronauts touch down and beam their images back to the 11 billion people sharing in the moment. The expedition is a joint effort supported by virtually all nations on the planet, the culmination of a decade and a half of intense focus on a common goal. A remarkable enough technical achievement, the Mars landing is even more important for what it symbolizes.

As the global viewing audience stares at the image of a distant Earth, seen from a neighboring planet 35 million miles away, the point is made as never before: We are one world. All organisms crammed on the globe are intricately interdependent. Plants, animals, humans need to find a way to live together on that tiny little place. By 2020, most people are acting on that belief. The population has largely stabilized. The spreading prosperity nudged a large enough block of people into middle-class lifestyles to curtail high birth rates. In some pockets of the world large families are still highly valued, but most people strive only to replicate themselves, and no more. Just as important, the world economy has evolved to a point roughly in balance with nature. To be sure, the ecosystem is not in perfect equilibrium. More pollution enters the world than many would like. But the rates of contamination have been greatly reduced, and the trajectory of these trends looks promising. The regeneration of the global environment is in sight.

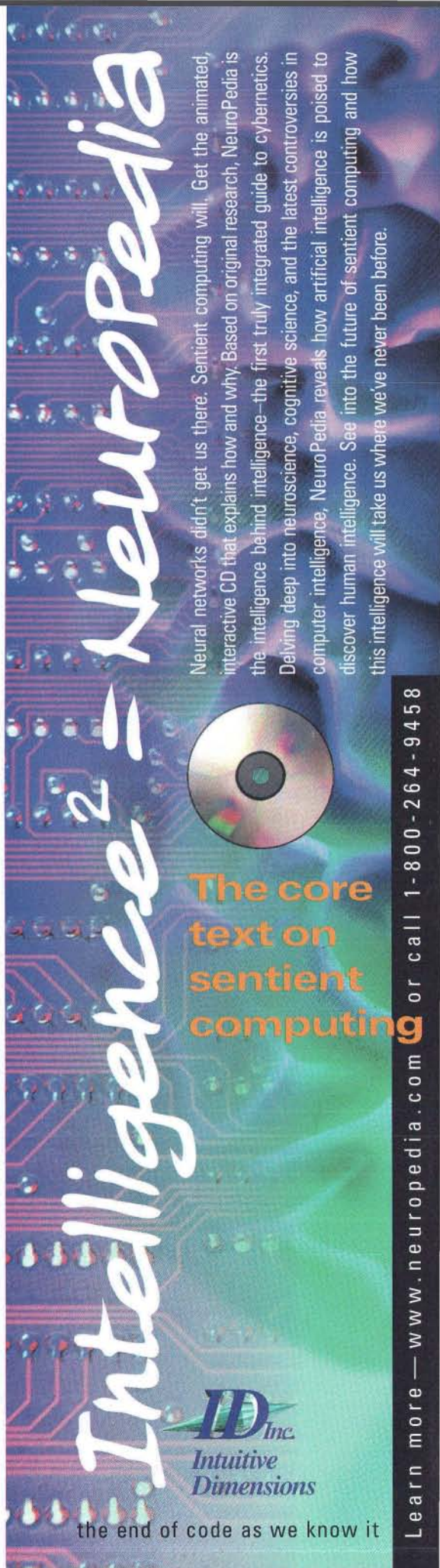
The images from Mars drive home another point: We're one global society, one human race. The divisions we impose on ourselves look ludicrous from afar. The concept of a planet of warring nations, a state of affairs that defined the previous century, makes no sense. Far better to channel the aspirations of the world's people into collectively pushing outward to the stars. Far better to turn our technologies not against one another but toward a joint effort that benefits all. And the artificial divisions we perpetuate between races and genders look strange as well. All humans stand on equal footing. They're not the same, but they're treated as equals and given equal opportunities to excel. In 2020, this point, only recently an empty platitude, is accepted by almost all.

We're forming a new civilization, a global civilization, distinct from those that arose on the planet before. It's not just Western civilization writ large – one hegemonic culture forcing itself on others. It's not a resurgent Chinese civilization struggling to reassert itself after years of being thwarted. It's a strange blend of both – and the others. It's something different, something as yet being born. In 2020, information technologies have spread to every corner of the planet. Real-time language translation is reliable. The great cross-fertilization of ideas, the ongoing, never-ending planetary conversation has begun. From this, the new crossroads of all civilizations, the new civilization will emerge.

In many ways, it's a civilization of civilizations, to use a phrase coined by Samuel Huntington. We're building a framework where all the world's civilizations can exist side by side and thrive. Where the best attributes of each can stand out and make their unique contributions. Where the peculiarities are cherished and allowed to live on. We're entering an age where diversity is truly valued – the more options the better. Our ecosystem works best that way. Our market economy works best that way. Our civilization, the realm of our ideas, works best that way, too.

THE MILLENNIAL GENERATION

By 2020, the world is about to go through a changeover in power. This happens not through force, but through natural succession, a generational transition. The aging baby boomers, born in the wake of World War II, at the beginning of the 20th century's 40-year global economic boom, are fading from their prominent 172 ►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◂ 171 positions of economic and moral leadership. The tough-minded, techno-savvy generation that trails them, the digital generation, has the new world wired. But these two generations have simply laid the groundwork, prepared the foundations for the society, the civilization that comes next.

The millennial generation is coming of age. These are the children born in the 1980s and 1990s, at the front end of this boom of all booms. These are the kids who have spent their entire lives steeped in the new technologies, living in a networked world. They have been educated in wired schools, they have taken their first jobs implicitly understanding computer technologies. Now they're doing the bulk of society's work. They are reaching their 40s and turning their attention to the next generation of problems that remain to be cracked.

These are higher-level concerns, the intractable problems – such as eradicating poverty on the planet – that people throughout history have believed impossible to solve. Yet this generation has witnessed an extraordinary spread of prosperity across the planet. They see no inherent barrier to keep them from extending that prosperity to – why not? – everyone. Then there's the environment. The millennial generation has inherited a planet that's not getting much worse. Now comes the more difficult problem of restoration, starting with the rain forests. Then there's governance. Americans can vote electronically from home starting with the presidential election of 2008. But e-voting is just an extension of the 250-year-old system of liberal democracy. Interactive technologies may allow radically new forms of participatory democracy on a scale never imagined. Many young people say that the end of the nation-state is in sight.

These ambitious projects will not be solved in a decade, or two, or even three. But the life span of this generation will stretch across the entire 21st century. Given the state of medical science, most members of the millennial generation will live 100 years. Over the course of their lifetimes, they confidently foresee the solutions to many seemingly intractable problems. And they fully expect to see some big surprises. Almost certainly there will be unexpected breakthroughs in the realm of science and technology. What will be the 21st-century equivalent of the discovery of the electron or DNA? What strange new ideas will emerge from the collective mind of billions of brains wired together throughout the planet? What will happen when members of this millennial generation possibly confront a new species of their own making: *Homo superior*? And what happens if after all the efforts to methodically scan the skies, they finally latch onto signs of intelligent life?

JUST DO IT

Beam back down to Planet Earth. Get your head back to 1997, not even halfway through the transition of this 40-year era. We're still on the front edge of the great global boom, the long boom. Almost all the work remains before us. And a hell of a lot of things could go wrong.

This is only a scenario of the future, by no means an outright prediction of what is to come. We can be reasonably confident of the continuation of certain trends. Much of the long boom's technology is already in motion and almost inevitably will appear within that span. Asia is ascendant whether we like it or not. Barring some bizarre catastrophe, that large portion of the world will continue to boom. But there are many unknowns, all kinds of critical uncertainties. Will Europe summon the political will to make the transition to the new economy? Will Russia avoid a nationalist retrenchment and establish a healthy market economy – let alone democracy? Will China fully embrace capitalism and avoid causing a new cold – or hot – war? Will a rise in terrorism cause the world to pull back in constant fear? It's not technology or economics that pose the biggest challenges to the long boom. It's political factors, the ones dependent on strong leadership.

One hundred years ago, the world went through a similar process of technical innovation and unprecedented economic integration that led to a global boom. New transportation and communications technologies – railroads, telegraphs, and telephones – spread all over the planet, enabling a coordination of economic activity at a level never seen before. Indeed, the 1890s have many parallels to the 1990s – for better or worse. The potential of new technologies appeared boundless. An industrial revolution was spurring social and political revolution. It couldn't be long, it seemed, before a prosperous, egalitarian society arrived. It was a wildly optimistic time.

Of course, it all ended in catastrophe. The leaders of the world increasingly focused on narrow national agendas. The nations of the world broke from the path of increasing integration and lined up in competing factions. The result was World War I, with everyone using the new technologies to wage bigger, more efficient war. After the conflict, the continued pursuit of nationalist agendas severely punished the losers and consolidated colonial empires. The world went from wild optimism to – quite literally – depression, in a very short time.

The lessons of World War I contrast sharply with those of World War II. The move toward a closed economy and society after the first war led to global fragmentation as nations pulled back on themselves. In the aftermath of World War II, the impetus was toward an open economy and society – at least in half the world. This led down a path of continuing integration. World leaders had the foresight to establish an array of international institutions to manage the emerging global economy. They worked hard to rebuild their vanquished enemies, Germany and Japan, through generous initiatives like the Marshall Plan. This philosophical shift from closed to open societies came about through bold leadership, much of it coming from the United States. In the wake of World War I, American political and business leaders embraced isolationism – with severe consequences for the world. After World War II, they did the opposite – with very different results.

Today, the United States has a similarly crucial leadership role to play. There are purely practical reasons for this. The United States has the single largest economy in the world, a market with a big

influence on the flow of world trade. It has the biggest research and scientific establishment by far. Since the demise of the Soviet Union, no other country features a comparable array of university research facilities, corporate industrial labs, and nonprofit think tanks. That combination of a huge economy and a scientific élite gives the United States the world's strongest military; the country can develop the weapons and pay the bills. For the next 15 years at the very least, America will be the preeminent military power. These reasons alone ensure that the United States, regardless of the intentions of its leaders, will have a huge influence on any future scenario. But the role of the United States is more involved, more complicated than that.

The United States is the great innovator nation, the incubator of new ideas. Just as the new technologies of the early Industrial Revolution were born in England, the vast majority of innovations in the computer and telecommunications fields are happening now in the United States. Americans are fundamentally shaping the core technologies and infrastructure that will be at the foundation of the 21st century. Partly because of that, the US is the first country to transition to the new economy. American corporations are the first to adopt the new technologies and adapt to the changing economic realities. As a nation, the United States is figuring out how to finesse the new model of high economic growth driven by new technologies. The American people are feeling the first social and cultural effects. And the government is the first to come under the strain to change. The United States is paving the way for other developed nations and, eventually, the rest of the nations of the world.

Even more important, the United States serves as steward of the idea of an open society. The US is home to the core economic and political values that emerged from the 20th century – the free-market economy and democracy. But the idea of an open society is broader than that. Americans believe in the free flow of ideas, products, and people. Historically, this has taken the form of protecting speech, promoting trade, and welcoming immigrants. With the coming of a wired, global society, the concept of openness has never been more important. It's the linchpin that will make the new world work.

In a nutshell, the key formula for the coming age is this: Open, good. Closed, bad. Tattoo it on your forehead. Apply it to technology standards, to business strategies, to philosophies of life. It's the winning concept for individuals, for nations, for the global community in the years ahead. If the world takes the closed route, it starts a vicious circle: Nations turn inward. The world fragments into isolated blocs. This strengthens traditionalists and leads to rigidity of thought. This stagnates the economy and brings increasing poverty. This leads to conflicts and increasing intolerance, which promotes an even more closed society and a more fragmented world. If, on the other hand, the world adopts the open model, then a much different, virtuous circle begins: Open societies turn outward and strive to integrate into the world. This openness to change and exposure to new ideas leads to innovation and progress. This brings rising affluence and a decrease in poverty. This leads to growing tolerance and appreciation of diversity, which promotes a more open society and a more highly integrated world.

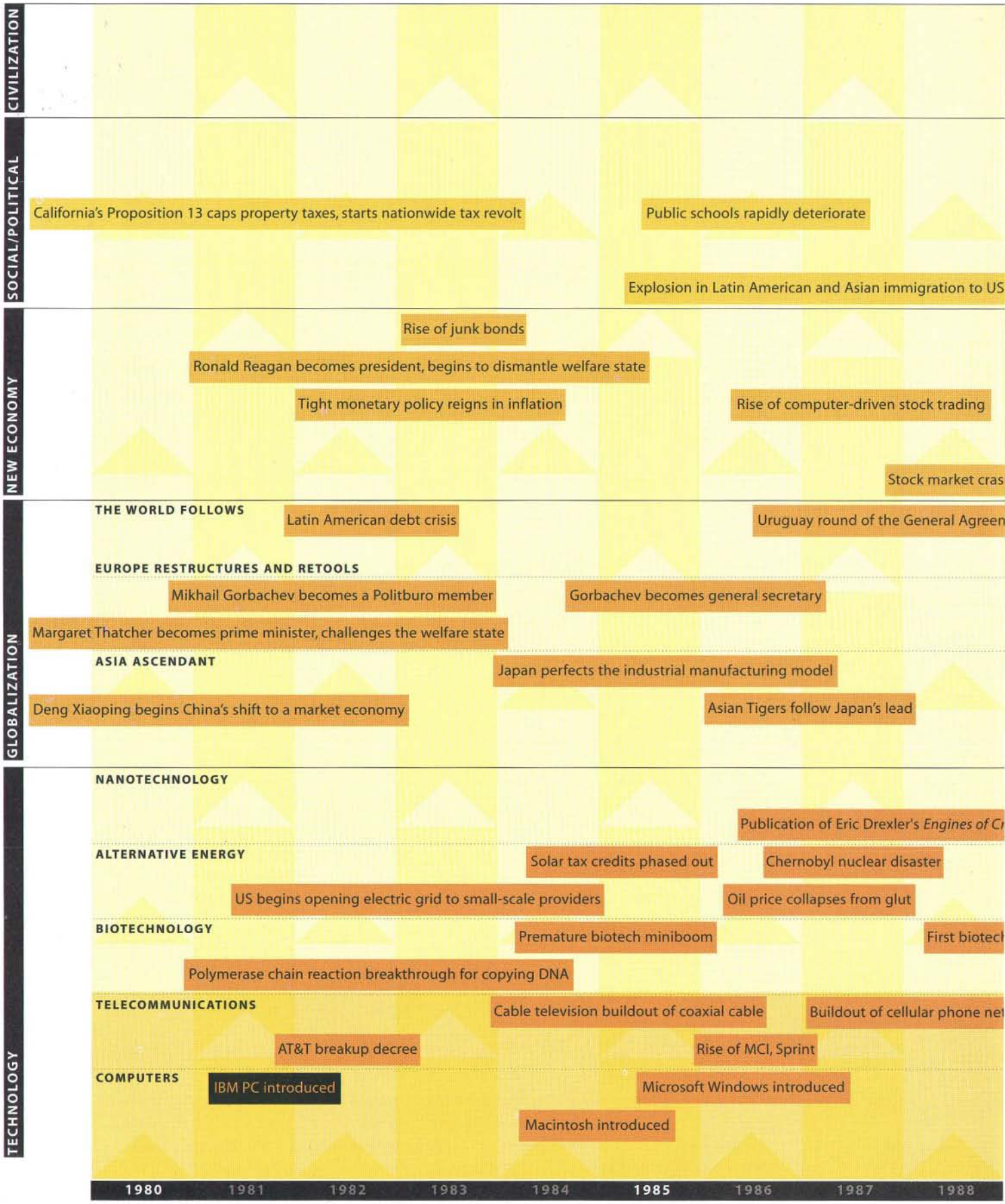
With the coming wired, global society, openness has never been more important. It's the linchpin that makes everything work.

The United States, as first among equals, needs to live this concept in the coming decades. One of the first great tasks will be integrating its former communist adversaries China and Russia into the world community, in much the same way that it once did Japan and Germany. This will be the main geopolitical challenge of the next dozen years. We'll know if we made it by 2010. Then there's the need to create a complex fabric of new global economic and political institutions to fit the 21st century. Though these need not take the bureaucratic shape they did in the past, a certain level of coordination of global activities will continue to fall in the public sphere. In the technical realm, some body needs to mediate the setting of global technical standards and the allocation of what are, at the moment, scarce resources like airwaves. In the legal arena, we need to find ways to protect the rights of creators and consumers of intellectual property. In terms of the environment, the collective world community needs to get cracking on problems that endanger everyone: global climate change, loss of the ozone layer, and other cross-border problems like acid rain. And then there are the issues that fall under security. We spent decades in excruciating negotiation to disarm and limit nuclear proliferation. In an age of information warfare, we face a very different set of security concerns and a laborious process to find global solutions – starting with a workable accord on cryptography.

The vast array of problems to solve and the sheer magnitude of the changes that need to take place are enough to make any global organization give up, any nation back down, any reasonable person curl up in a ball. That's where Americans have one final contribution to make: optimism, that maddening can-do attitude that often drives foreigners insane. Americans don't understand limits. They have boundless confidence in their ability to solve problems. And they have an amazing capacity to think they really can change the world. A global transformation over the next quarter century inevitably will bring a tremendous amount of trauma. The world will run into a daunting number of problems as we transition to a networked economy and a global society. Apparent progress will be followed by setbacks. And all along the way the chorus of naysayers will insist it simply can't be done. We'll need some hefty doses of indefatigable optimism. We'll need an optimistic vision of what the future can be. ■ ■ ■

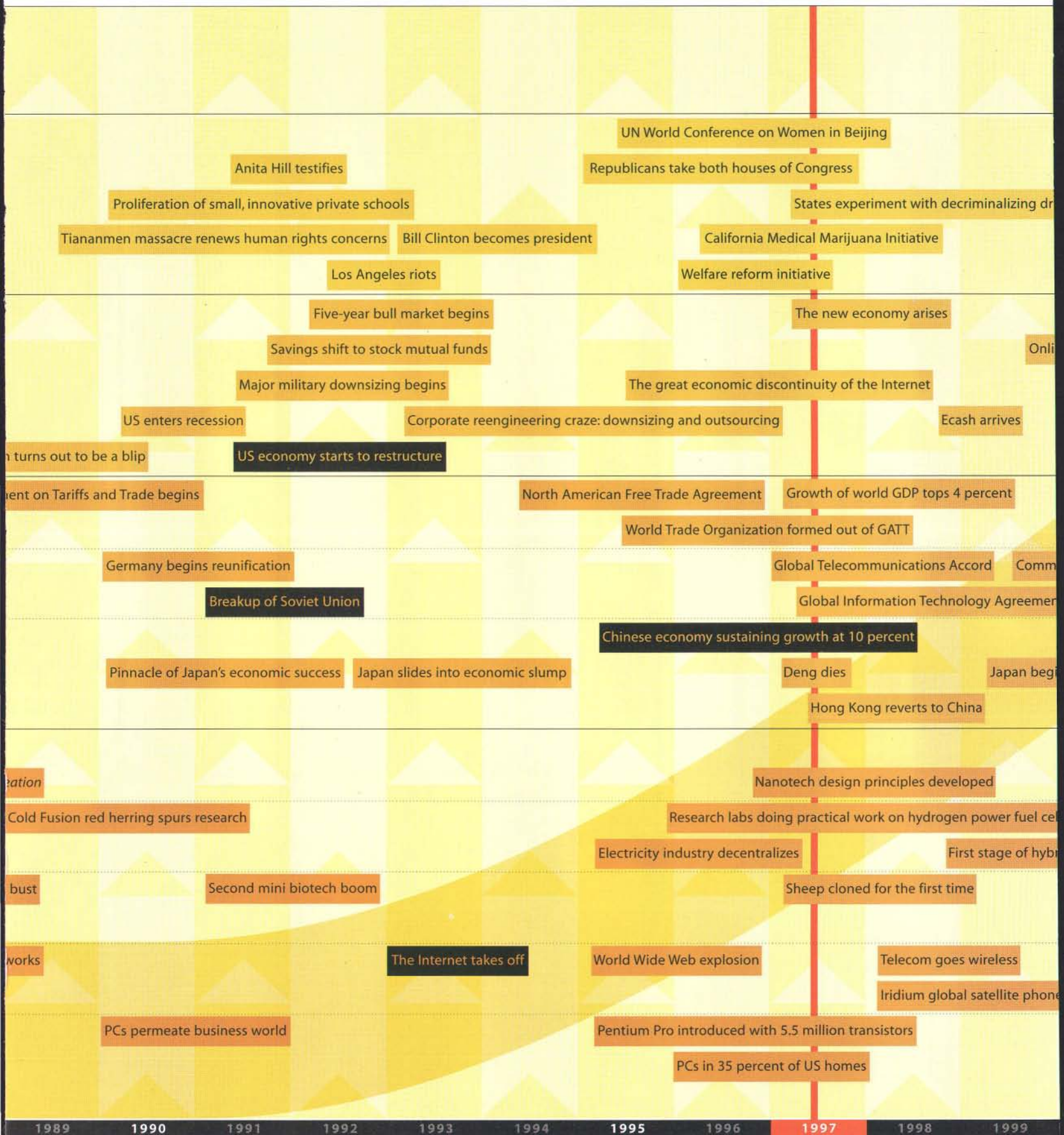
Talk with Peter Schwartz and Peter Leyden live Wednesday, July 9, at 6 p.m. PDT in the Wired Talk room at *www.talk.com/*.

THE FUTURE HISTORY OF THE WORLD: A TIME LINE



E FOR THE LONG BOOM

Say we are in the midst of a 40-year millennial transition, a period that began right around 1980. Say we are on the front lip of a worldwide economic boom. Looking back, we can identify early signs of the forces that have gathered strength over the last 15 years and are now driving through our lives.



By following that forward motion, we can rough out possible developments in the next couple decades. These are not outright predictions, but informed projections. They give shape to a positive scenario of the future, the long boom.

The layered tracks in the chart below show how key forces interrelate. The most fundamental has to do with the waves of technology rolling through the era. Almost equally important is the relentless process of globalization. The progression in these two tracks drives many of the changes in the economy. That's why the chart should be read from the bottom up as much as left to right

Mars project initiated by world community
Superpower nor
US tax coffers swell off booming economy
First e-voting from home in presidential electio
Project Gutenberg complete, 10,000 books online
Social Security and Medicare radically transformed to anticipate boomers
Widespread use of school vouchers
Transformation of K-12 education
Higher education radically reforms
The education election
Immigration of knowledge workers actively encouraged
End of five-year welfare transition
Global green revolution in agricultural biotech
commerce clicks in
US$10 billion in online sales
Global networke
Alan Greenspan retires, Fed lifts foot off brakes
Health care industry booming on new biotech
US economy growing at 4 percent
Wholesale transformation of automobile and petrochemical industries begins
US productivity measures revised
All-American Free Trade Agreement
Growth of world GDP tops an astounding 6 percent
Middle East crisis; oil bottoms out
European currency (euro) adopted
Greater European Union expands to Eastern Europe
Europe begins painful economic restructuring
Russia emerges from capitalist transition
Chinese crisis av
to economically restructure
Torrid economic growth in China
China formalizes Chinese diaspora
Japan radically liberalizes domestic markets
Taiwan absorbed into mainland China
First molecular scale integrated chips and sensors
Solar industry hits US$1 billion in sales
California's zero-emission-car deadline
Second stage of hybrids powered by gas turbines
electric automobiles
Early hydrogen cars based on gasoline
Third stage of hy
Human Genome Project complete
Animals commonly used as organ donors
All birth defects eliminated
Most US produce genetically engineered
Cable Internet connections take off
High-bandwidth connections to the home common
High-bandwidt
Teledesic global satellite Internet
Digital TV transition period completed
Videophones catch on
Reliable handwriting recognition
Average computer screen same resolution as paper
Intel introduces
Reliable voice recognition
Intel introduces 350-million-transistor microprocessor
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along the time line. For example, a breakthrough in technology will – look up – affect the economy. As the economy shifts, social and political repercussions – look up again – almost certainly will follow. Finally, there are civilization-level changes, the megachanges that develop over the long haul. The civilization track is best viewed in the context of the entire 21st century. What you see here is just the start.

WIRED

Humans land on Mars
World economy roughly in balance with nature
Millennial generation comes of age
aggression treaty binds US, China, Europe, and Russia
A truly global culture emerges
The beginning of a global civilization of civilizations
First Global Environmental Restoration Convention
World population stabilizes at 11 billion
ns
Americans deep into making the multicultural society work
Immigrants drive revival of the family
d economy in place
Auto industries transition to alternative energies
omers begin to retire, fueling new round of health care growth
The Great Central African Crisis: 5 million die
World sustaining 6 percent growth rates
Italian nation-state becomes first in Europe to dissolve
erted
Chinese economy becomes world's biggest
2 billion Asians have made transition into middle class
Quantum computing takes off
First commercially available nanotech products
Desktop factories on the horizon
Revival of green nuclear power
brid cars fueled by pure hydrogen
Highly diverse clean energy sources
Gene therapy for cancer perfected
One-third of 4,000 genetic diseases controlled
First designer kid
Human life expectancy reaches 120 years
DNA computing on the horizon
n connections anywhere on the planet
illion-transistor 10-GHz microprocessor
Reliable simultaneous language translation
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